

### **TITLE OF INVENTION**

**Musical Instrument Amplifier with adjustable Loudspeaker**

### **TECHNICAL FIELD**

This invention relates in general to audio amplifier cabinets with loudspeaker arrangements, and more particularly, to musical instrument amplifiers such as guitar amplifiers.

### **CROSS-REFERENCE TO RELATED APPLICATIONS**

This application is claiming the benefits of my provisional patent application titled "Guitar Amplifier with Volume Control and tiltable Loudspeaker", appl. # 60/242,228 filed 10/23/2000.

### **BACKGROUND OF INVENTION**

Musicians who play electrified instruments need to use electrical amplifiers and associated loudspeaker cabinets to be audible. Such devices not only amplify the original sound of the instrument but significantly change its tonality by adding lower midrange and bass resonance frequencies to it, thus creating the well known typical sound of an

electrified instrument such as the electric guitar. This effect can easily be noticed if an electric instrument is played directly into a mixing console and the resulting sound is compared to the sound of the same instrument played through an amplifier.

The difference in sound occurs because there are three factors that add resonant frequencies to the amplified sound which is emanated from the loudspeaker.

Musical Instrument amplifiers usually consist of rectangular, preferably wooden boxes with the loudspeakers and the electronic components mounted therein. There are loudspeaker cabinets in conjunction with separate amplifier units and combo amplifiers, which combine the loudspeaker and the amplifier in one single unit. If these units are operated, the working loudspeakers not only emit sound via air but also cause the wooden cabinets to resonate at certain frequencies. Thereby additional volume in the bass and lower midrange frequencies is added to the amplified signal..

Another factor which significantly changes the tone of the amplified instrument is the exact amount of air which is encompassed by the wooden box that houses the loudspeaker. Like used to determine pitch in a wind instrument, the actual volume of resonating air in the cabinet defines a certain resonance frequency which adds volume to the sound, usually in the lower midrange. Therefore the volume of a given loudspeaker enclosure is crucial to its typical sound in combination with the instrument and must not be changed as the tone would then be significantly altered.

Loudspeaker enclosures and especially combo amplifiers are usually operated in an upright position on a support surface like a stage or the floor of a room. When operated in this position, the speaker cabinet or amp combo is acoustically coupled to the support surface and causes it to resonate as well, thus adding yet another portion of low frequencies to the sound. Although especially this particular effect is thoroughly avoided in HiFi loudspeaker systems, the additional resonant sound from the support surface makes a very important factor in the sound of a musical instrument amplifier such as a guitar amplifier.

In conjunction with the speaker sound and the resonating cabinet, the structure-born sound in the support surface adds low and mid-range frequencies (approx. 20-600 Hz) at random. Also certain, in HiFi systems unwanted effects of acoustic distortion occur and make musical instrument combo amplifiers and speaker cabinets sound "full" and "rich" to their users, especially if they are being designed as an open enclosure. These special sound characteristics are associated with the typical "trademark" sound of amplified electric guitar and many other electrified instruments. Players explicitly like this acoustic behavior of their equipment because they feel more dynamic response and have an almost "tangible tone" at their hands.

Yet a very specific problem that instrumentalists have to deal with is a problematic audibility in a performing situation. This occurs due to the limited directional sound characteristics of regular combo amplifiers or

loudspeaker cabinets which mostly are less than 23 inches in height and have the loudspeaker/s built in facing outward at an angle of 90 degrees.

Especially guitar and bass players traditionally perform standing up with their amplifiers sitting on the floor. In order to control their playing, it is necessary for an instrumentalist to hear the higher frequencies of their tone. Because the loudspeakers direct the sound of higher frequencies only towards the lower portion of the player, it is therefore impossible for them to monitor their own playing without being perceived as much too loud in relation to the sound of other instruments used in the same environment.

The disclosed invention shows a musical instrument amplifier with a resonator cabinet and an adjustable loudspeaker, which allows the instrumentalist to direct the high-frequent sound towards their ears without altering the characteristic sound of the amplifiers. The characteristic resonance frequencies of the enclosure are maintained constant and there is no loss of resonance frequencies in the support surface regardless of in what position the loudspeaker is adjusted to.

In order to achieve better audibility, several attempts have so far been utilized and are known as an approach to change the direction of the speaker emission towards the players ears.

Because musical instrument amplifiers, especially combo amplifiers for guitar, usually contain a single loudspeaker or a set of similar loudspeakers and sound as a wholesome unit, it is not possible to adjust

the loudspeaker/s in relation to the enclosure. Any reorientation of the speaker relative towards the cabinet would change the actual volume of the enclosure and its resonance frequencies and therefore the sound of the instrument would significantly be altered.

Amplifiers have sometimes been seen to be placed on a chair, a transport box or onto some kind of stand to facilitate raising the loudspeaker closer to the player's ear level.

Tilt-back stands have been used to aim the complete amplifier upward at some desired angle as an attempt to allow the player to better hear themselves.

Also, guitar amplifiers or loudspeaker cabinets have been provided with pivotal metal rods in order to allow tilting back the complete enclosure. This was especially done by the Fender company in the early 1960's. Another example for this prior art is shown in US-pat # 6101261 by Brown and James.

Yet all of the previous attempts do not solve the problem of satisfying audibility. Not only is it very inconvenient for players to eventually have to take care for an additional height support of their equipment, but there is a most significant reason for why most players still keep their amps or cabinets on the floor.

If amplifiers or cabinets are tilted back or placed upon stands, the transmission of structure-born sound to the support surface is partially or

completely cut off. Thereby the enclosure and the support surface are no longer acoustically coupled and players have to deal with a lack of bass and lower midrange frequencies. The sound characteristics are significantly altered and the devices are perceived to sound "thin" or "weak". Accordingly most instrumentalists don't like to tilt back or elevate their equipment for this reason.

In addition to this main reason to keep an amplifier on the floor, several other shortcomings occur simultaneously with the loss of sound.

If musicians elevate their amplifiers and speakers off of the floor by utilizing makeshift stands such as stools, chairs, boxes, and the like, this might lead to accidents when the amplifiers are accidentally knocked off the stand or pulled off of the stand by cables connected thereto.

Tilting back a loudspeaker cabinet or combo amp takes at least twice, usually up to three times as much floor space as if the same equipment would be placed upright. This is extremely inconvenient on a small stage or in a practice room with limited space capacity.

Tilting back a working guitar amplifier cuts off the upward air stream of heat dissipation around the enclosure and heat congestion in the top part occurs. Because the electronic components of a combo amp are usually mounted into the upper section of its enclosure, this leads to overheating the circuit and might cause severe damage to the amplifier.

Also, due to limited space especially on small stages, players commonly use the horizontal surfaces of their equipment to place their accessories on.

All the above discussed shortcomings of prior art attempts don't show a satisfying solution but lead to a conflict for players. They either have to sacrifice audibility and monitoring or they need to deal with a major loss in sound quality and safety. Because most players would not want to give up on the traditional tone and alter the sound of their instrument, it is highly desirable to provide an instrument amplifier or a loudspeaker cabinet that offers adjustable directional sound without changing its sound characteristics when operated. Such a combo amplifier is disclosed by the present invention and can be alternatively built as just a loudspeaker cabinet.

#### SUMMARY OF THE INVENTION

Object of the present invention is to provide a musician's amplifier or loudspeaker enclosure that permits the musician to adjust the directivity of sound by altering the listening axis of the loudspeaker (i.e., a line from the center of the loudspeaker to the center of the listener's head at ear level) towards a desired direction, without changing or disabling the significant resonant frequencies which occur within the enclosure and the adjacent support surface and thereby maintaining the rendered sound constant. Either having to change the volume of air encompassed by the cabinet, disabling the resonance within the cabinet itself or having to cut off

resonance in the support surface by removing the enclosure from its acoustically coupled position thereto would cause a significant change in sound and is avoided with use of the present invention. Although certain situations eventually might require a sidewise orientation, the preferred embodiment of the present invention allows changing the listening axis of the loudspeaker upward or downward, making it possible to send the higher frequencies directly to the listener's ear.

In accordance with the present invention, there is provided a loudspeaker cabinet combination comprising two separate enclosures combined into each other.

An outer open part of the cabinet acts as a resonator and provides transmission of structure born sound to the support surface in order to cause it to resonate. This outer part may also hold electronic components of a combo amplifier.

An inner, half open or closed part of the cabinet determines the sound of the enclosure by its specific dimensions, holds at least one loudspeaker and is mounted into said outer cabinet part in such a way that it causes resonance in the outer part and that it can be swiveled upwards and downwards in a multitude of desired angles in order to allow adjustment of the listening axis towards the operators ears.

Said inner cabinet part can be fixed in any chosen position to said outer cabinet part in such a way that both cabinet parts are acoustically coupled

and resonate as a wholesome enclosure at all times.

Manually operable lock members can be loosened even during a continuing performance, thus allowing the player a convenient reorientation of the listening axis. If the desired angle is found, the inner, sound-creating cabinet part can be conveniently fixed in its position and acoustically coupled to the outer, resonant-transmitting cabinet part by simply re-tightening the lock means.

While the invention may be utilized with any type of speaker enclosure wherein no electronic means is disposed within the enclosure, it is especially adapted to be utilized as a combo guitar amplifier because it is particularly desirable that compact sound systems for amplified electric guitar would be built in such a way that they allow adjustment of the listening axis .

Although resonance in the support surface is well known as a crucial factor for a good guitar sound by those skilled in the art, the prior art does not show any amplifiers or loudspeaker enclosures with a possibility to alter the listening axis of the loudspeaker without cutting off the transmission of structure-born sound from the enclosure to its support surface and the resonance therein. This lack of technology is overcome by the further disclosed invention.

The combination cabinet of the present invention can be maintained in an upright position towards the contact surface at all times and the "full"

sound of the enclosure is never impaired. There is no danger of overheating a built-in amplifier or dropping equipment or accessories placed thereon and a perfect direction of sound to the players ear can be achieved even on a very small or very crowded stage.

Also, such a combination enclosure is easy to handle, conveniently to use and no extra equipment is necessary. Manufacturing at low cost would be easy to achieve since no expensive special parts are needed.

Additional objects and advantages of the invention will be set forth in part in the description that follows, and in part will become apparent to those skilled in the art upon examination of the following or may be learned by practice of the invention.

#### **DESCRIPTION OF DRAWINGS**

FIG. 1 shows a prior art construction in a tilted position

FIG. 2 is a view similar, illustrating the preferred embodiment of the invention

FIG. 3 shows a guitar player using a prior art amplifier support construction

FIG. 4 shows a guitar player using a construction as shown in Fig. 1

FIG. 5 shows a guitar player using the preferred embodiment of the present invention on a medium large stage

FIG. 6 shows a guitar player using the preferred embodiment of the present invention on an average small stage

FIG. 7 is a top perspective view of the preferred embodiment of the present invention with the combination cabinet in a transport or initial position

FIG. 8 is a top perspective view of the preferred embodiment of the present invention with the combination cabinet in an angular operating position

FIG. 9 is an exploded view of the preferred embodiment of the present invention

#### DESCRIPTION OF THE INVENTION

Fig. 1 shows a prior art amplifier 22 with tilt back legs 24 on a support surface 20. The amp is equipped with supporting contact members which are placed in such a way that they transmit structure born sound 38 to the contact surface 20 and thereby causing it to resonate. Because the

amplifier is tilted back, the transmission of structure born sound is cut off and resonance in the support surface is disabled. The outer part of the combination enclosure 30 of the preferred embodiment of the present invention does not need to be tilted back in order to achieve alteration of the listening axis of the loudspeaker. The adjustable inner cabinet part 32 can be tilted back individually and structure born sound 36 is completely transmitted via the outer cabinet part 30 to the support surface 20 by contact members 34, causing it to resonate and thereby making it part of the sound system.

If a guitar player 40 uses either such an enclosure 22, as shown in Fig. 4, or decides to use a portable support stand 28 as shown in Fig. 3 there is no transmission of structure born sound to the support surface and usually the listening axis 42 is maintained adjusted at a constant angle. Fig 5 and 6 show a guitar player using the combination enclosure of the present invention. The adjustable inner cabinet part 32 can be fixed in a plurality of multiple angular positions, thus allowing convenient adjustment of the listening axis to the players ear level on a small stage (Fig. 6) as well as on a larger stage (Fig. 5.). Resonance within the combination enclosure is never interrupted and the transmission of structure born sound to the adjacent support surface is never interrupted, thereby making said support surface always part of the sound system.

Fig. 7 shows the combination enclosure of the present invention in a transport or initial position. The inner cabinet part 32 is locked vertically into the outer cabinet part 30 by lock members (shown in Fig 9) attached

oppositely to pivot bolts 50.

If, as shown in Fig. 8, the inner cabinet part 32 is tilted back, sound can be emitted freely, also passing through sound opening 44 of the outer cabinet part 30 without being reflected by amplifier chassis 46 which contains the electric circuit for amplification. Also, the control elements 58 of the amplifier 46 can still be conveniently reached in tilt-back mode.

Fig 9 depicts the lock mechanism comprising pivot bolts 50, washers 54 and locknuts 56. Large contact members 52 are installed to ensure transmission of structure born sound from inner cabinet part 32 to outer cabinet part 30 thereby keeping both enclosures constantly acoustically coupled.

#### OPERATION OF THE INVENTION

Since most guitar amplifiers are less than 23 inches in height, the enclosure of the amplifier usually sits on a support surface such as the floor with the loudspeakers facing forward and directed essentially parallel to the floor. This makes it hard for the player to hear themselves play because the sound is basically beaming out of the speakers at knee-level or, when the amplifier is placed on a chair, at hip-level.

The present invention provides a guitar amplifier/loudspeaker combination cabinet which allows tilting back the actual loudspeaker without having to either alter the volume of its sound-creating enclosure

and/or without having to remove the resonating wholesome unit partially or completely from its support surface.

With the present invention, instrumentalists who perform on a small stage can have their higher frequency sound beaming upward at a variety of different convenient angles in order to enhance monitoring of their playing. The listening axis of the loudspeaker/s can easily be set without having to tilt back the complete enclosure or having to alter its sound characteristics. This is extremely helpful on a small stage or when the player works in an orchestra.

This novel musical instrument amplifier is easy to make and would make a significant difference to many guitar players and bassists. Further adaptations or minor modifications within the spirit of the invention will be apparent to those skilled in the art. Also, from the foregoing disclosure, those skilled in the art might devise many uses and modifications of the present invention. It is, therefore, intended that the scope of the present invention be not limited by the foregoing specification.

#### SEQUENCE LISTING

Non applicable

*List of Reference Numbers*

support surface	20
prior art enclosure	22
metal rod	24
regular enclosure	26
prior art amplifier stand	28
outer part of enclosure	30
inner part of enclosure	32
baffle board	33
supporting contact member	34
structure-born sound waves	36
sound waves	38
guitar player	40
listening axis	42
sound opening	44
amplifier chassis	46
loudspeaker	48
pivot bolt	50
contact member	52
washer	54
locknut	56
control element	58